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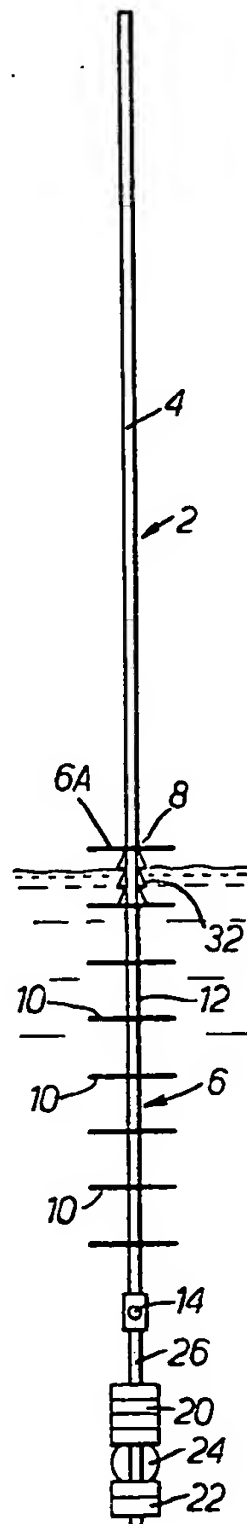
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 GB 1490870
 GB 1362865
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 US 3660807A
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(54) Hydrodynamic Devices

(57) A hydrodynamic device 2 comprising first and second parts 4, 6 which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end

portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements 10, and (b) towing means 14 for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

FIG. 2.

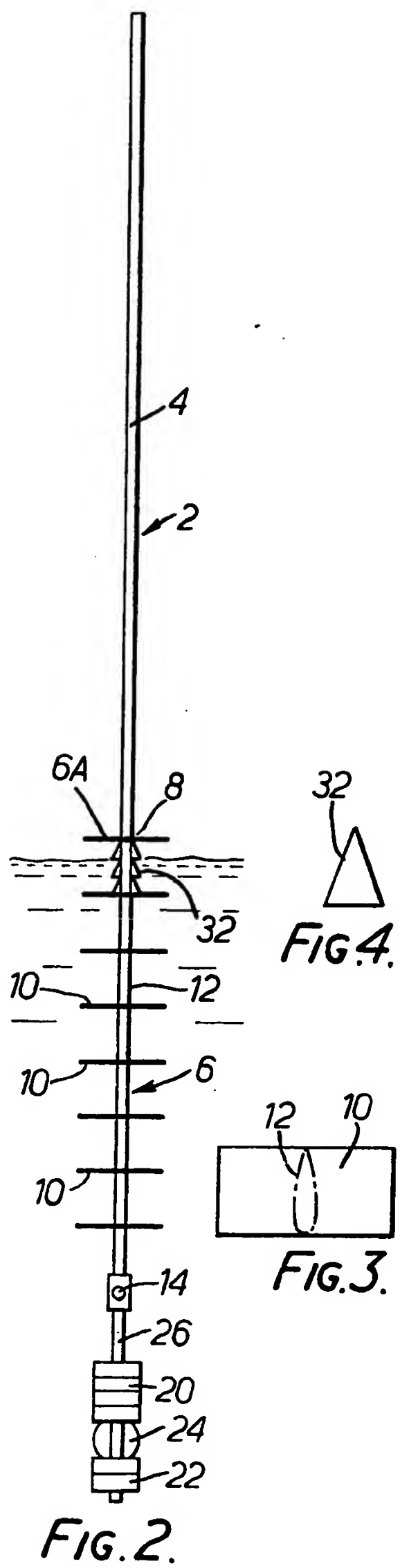
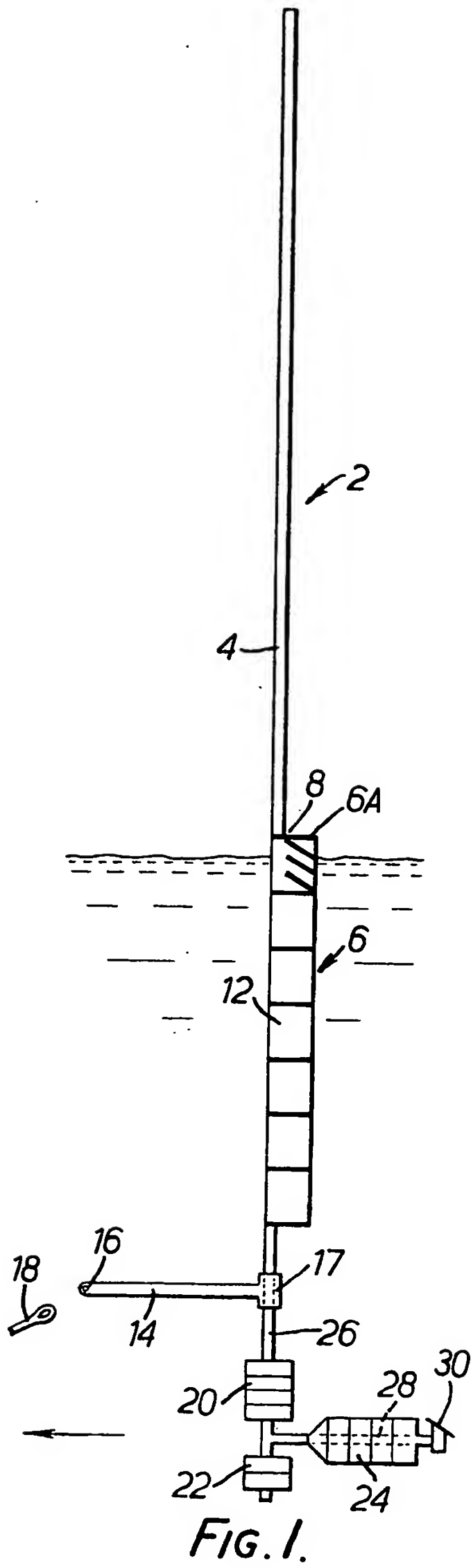


The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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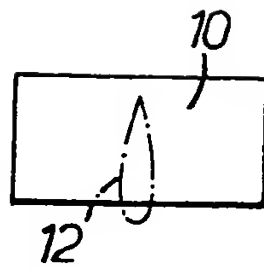
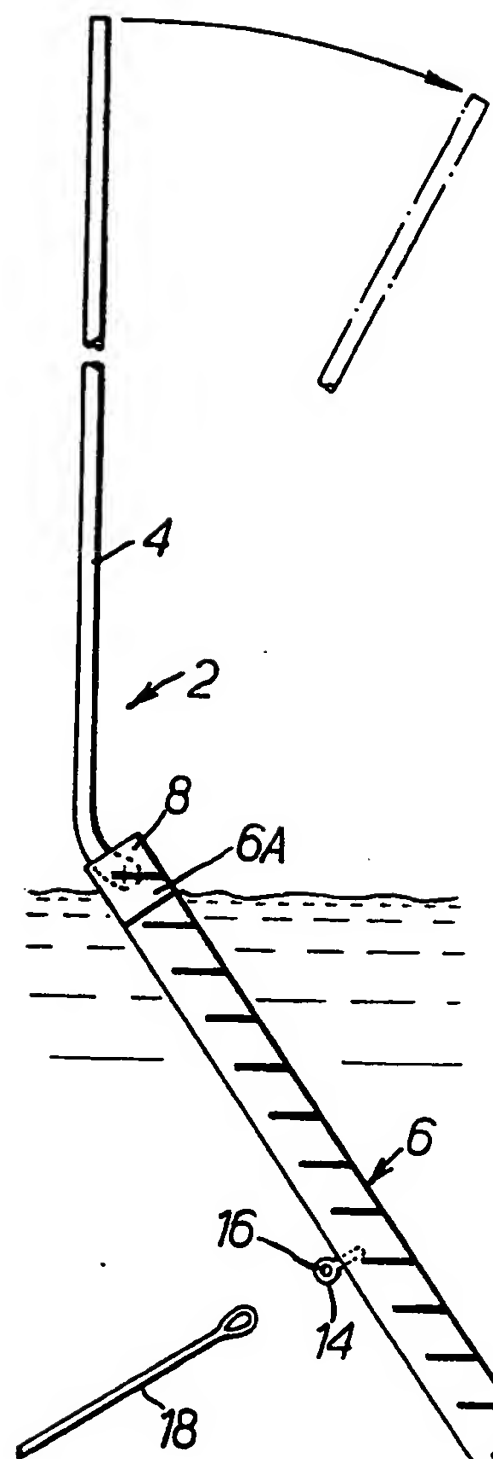


FIG. 7.



FIG. 8.

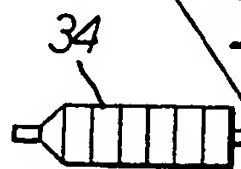


FIG. 5.

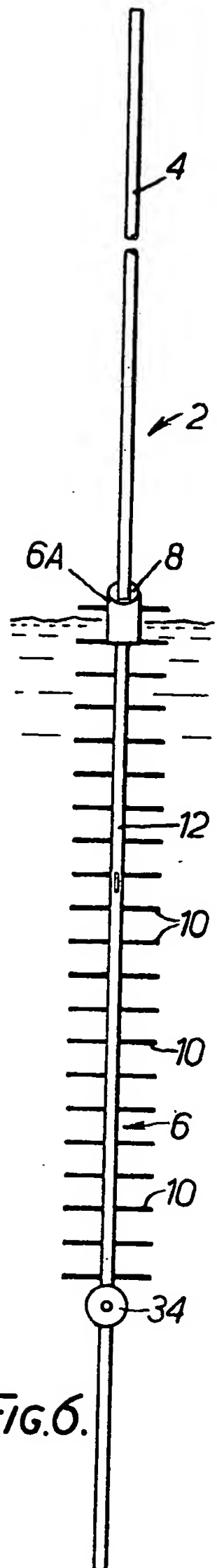


FIG. 6.

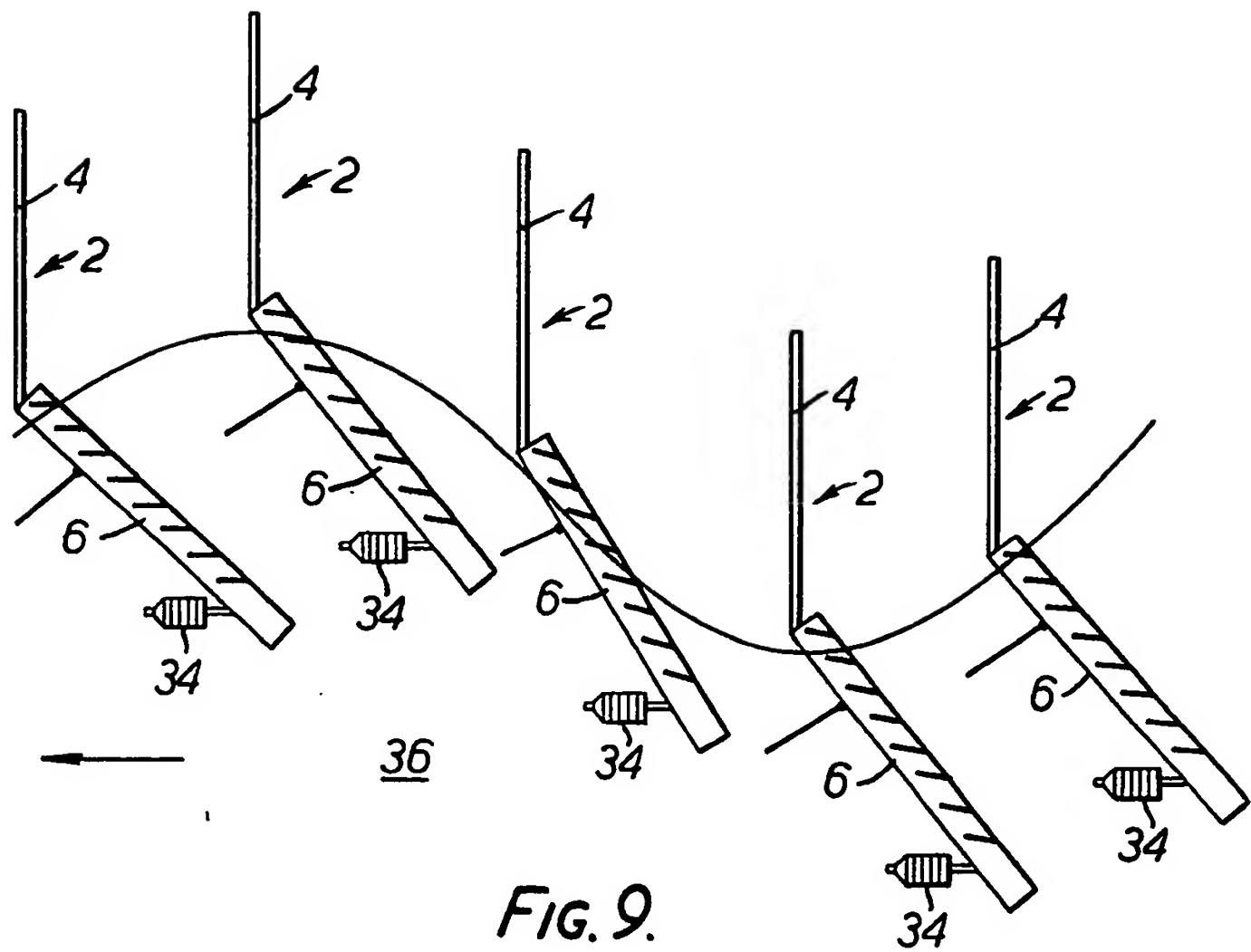


FIG. 9.

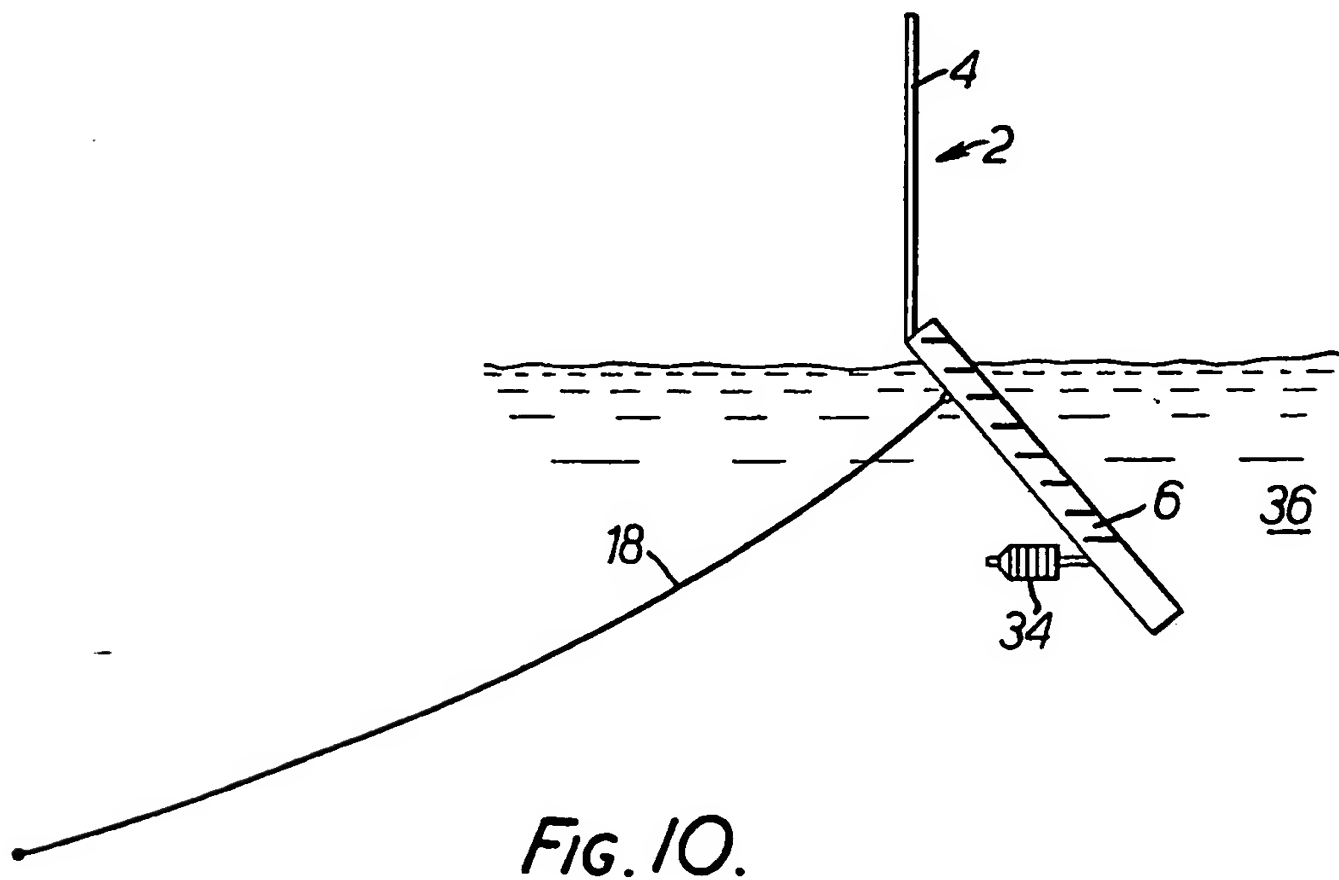


FIG. 10.

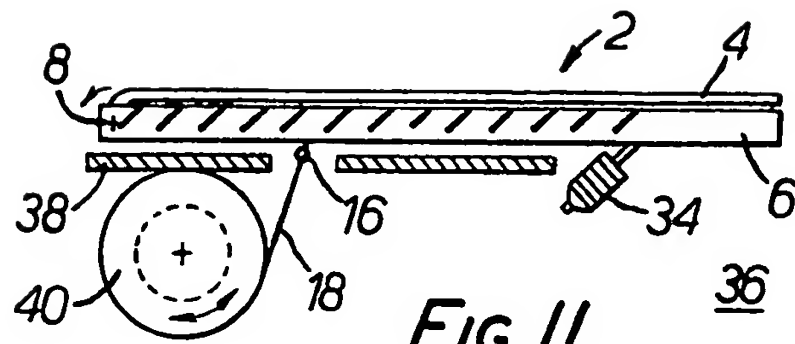


FIG. 11.

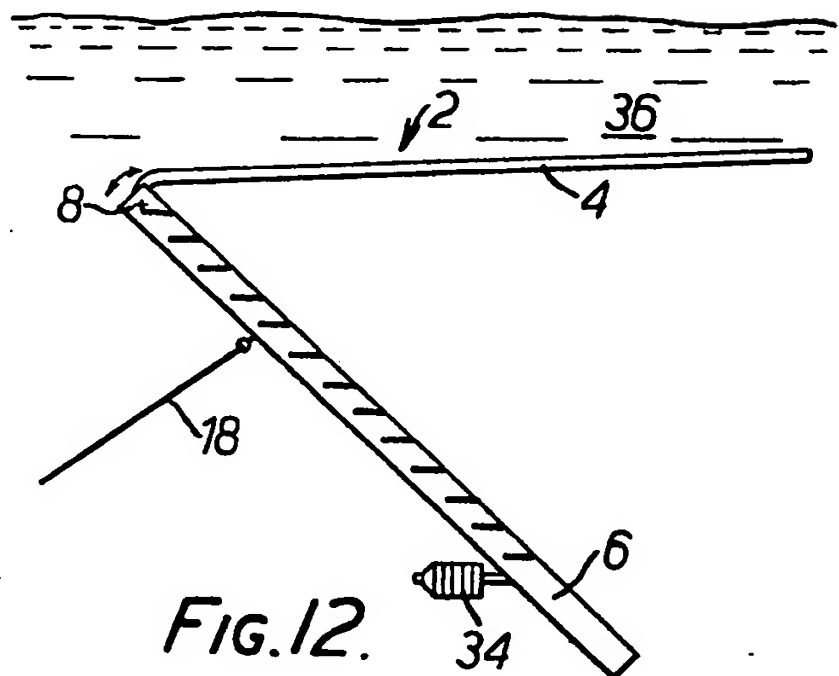


FIG. 12.

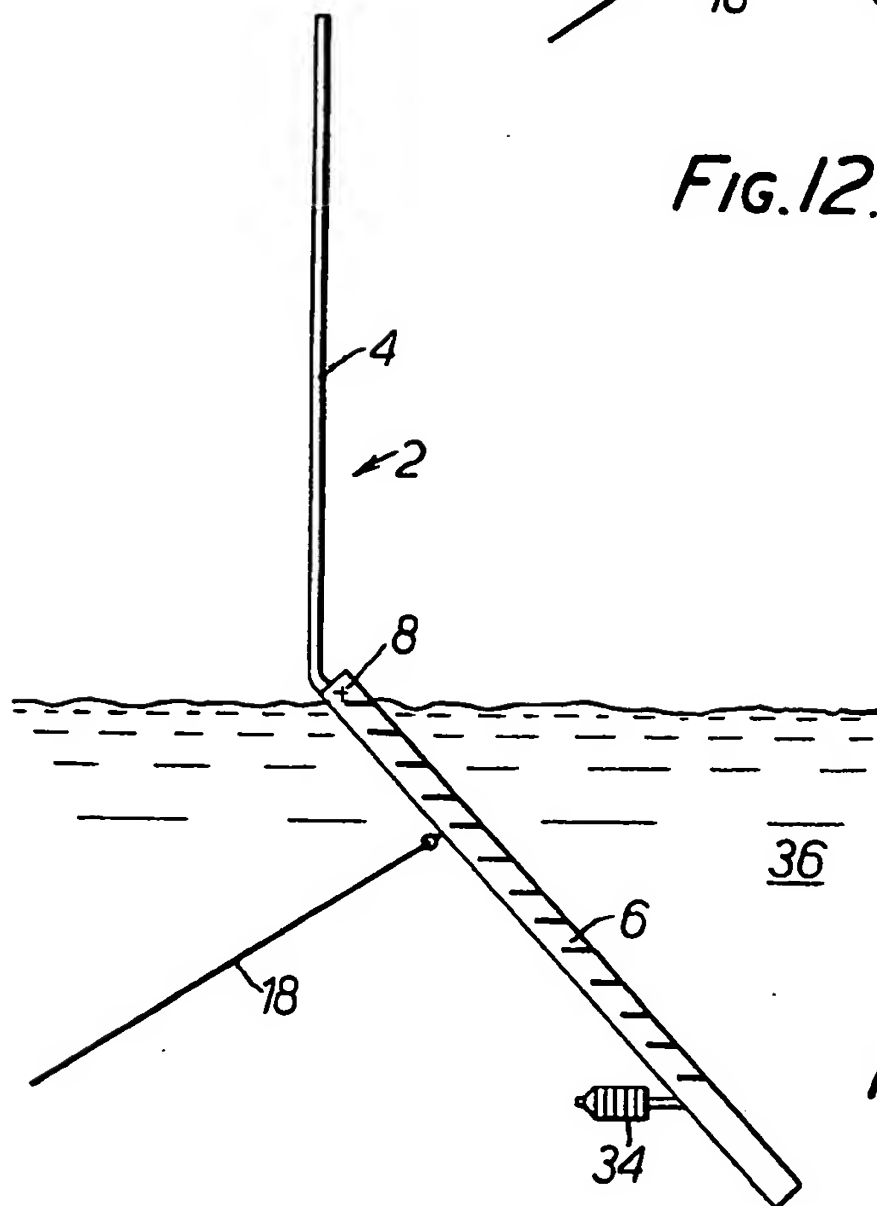


FIG. 13.

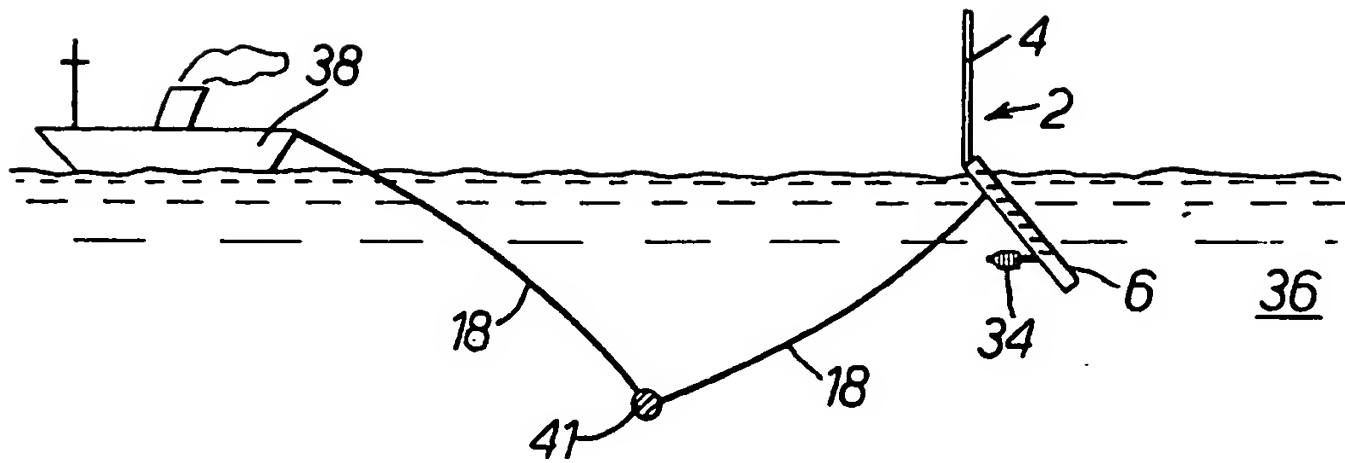


FIG. 14.

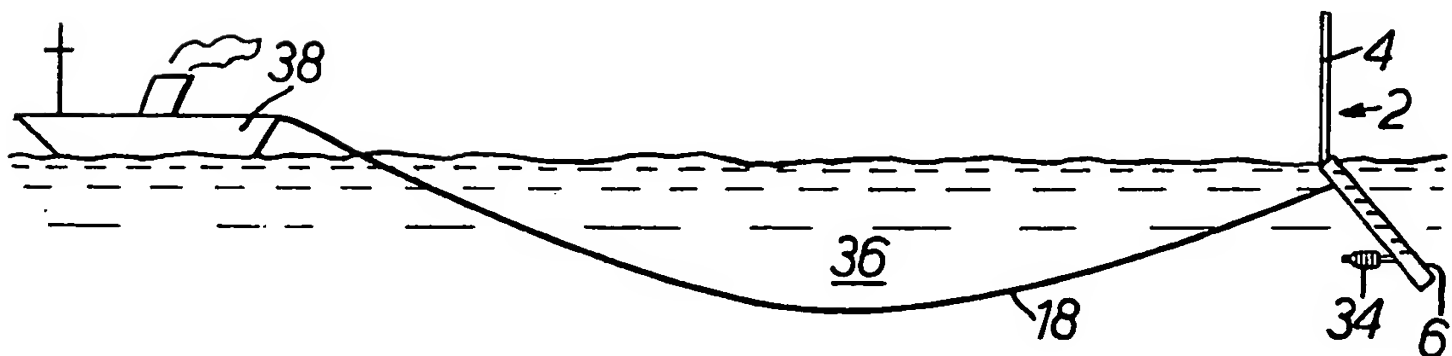


FIG. 15.

SPECIFICATION

Hydrodynamic Devices

This invention relates to a hydrodynamic device.

More specifically, this invention relates to a
5 hydrodynamic device comprising first and second
parts which are connected together such that the
first part is movable from a storage position in
which it lies adjacent to the second part to an
10 operable position in which it upstands from and
extends from one end portion of the second part,
the second part comprising an elongate member
having (a) a plurality of transversely extending
hydrofoil elements, and (b) towing means for
15 enabling a connection to be made between the
hydrodynamic device and a towing vessel
whereby the hydrodynamic device can be towed
in water with the first part visible above the water
and the second part submerged.
The hydrodynamic device of the invention is
20 designed so that it can be towed through the
water without creating much wake. The
hydrodynamic device is also designed to be
vertically stable in use so that it can operate in
high sea conditions. The device is non-buoyant in
25 water and its characteristics are controlled by its
second part which is thus hydrodynamically more
important than its first part.

Preferably, the first and second parts are
connected together by a sprung hinge
30 arrangement. Such an arrangement allows the
first part to easily and automatically move from its
stored position to its upstanding operable
position. Alternative arrangements for connecting
the first and second parts together include a
35 simple pivot whereby the first part can be moved
from its stored position to its upstanding position
merely by the use of appropriate hydrodynamic
and aerodynamic vanes or by a counter balance
weight system.

40 Advantageously, the first and second parts are
so connected together that the first part lies
substantially exactly flat. In order to achieve this,
the precise arrangement by which the first and
second parts are connected together may include
45 auxiliary means such for example as a push rod
which engages on a storage platform for getting
the first part in the desired substantially flat
condition.

Preferably, the hydrofoil elements are spaced
50 apart by spacer elements.

The pair of hydrofoil elements that are
uppermost when the device is being towed
through the water may be provided with drag
vanes for controlling the depth at which the
55 second part is submerged. The drag vanes make
the hydrodynamic device very sensitive to small
depth variations.

Preferably, the towing means is a towing eye
but it is to be appreciated that other devices can
60 be employed.

The first part may be constituted by an aerial, a
marker, a target or a radar reflector.

The hydrodynamic device may include
weighting means, for example positioned on the

65 end portion of the second part that is remote from
the first part, for stabilizing the hydrodynamic
device and for causing it to tow in a vertical or an
included position.

Embodiments of the invention will now be
70 described solely by way of example and with
reference to the accompanying drawings in
which:

Figure 1 is a side view of a first hydrodynamic
device in accordance with the invention;

75 Figure 2 is an end view of the device shown in
Figure 1;

Figures 3 and 4 show detailed parts of the
device shown in Figure 1;

80 Figure 5 is a side view of a second
hydrodynamic device in accordance with the
invention;

Figure 6 is an end view of the device shown in
Figure 5;

85 Figures 7 and 8 show detailed parts of the
device shown in Figure 5;

Figures 9 and 10 show the device somewhat
schematically as it is being towed through water;

Figure 11 shows the device of Figure 5 in a
stowed position;

90 Figure 12 shows the device of Figure 5 in a
partially open position;

Figure 13 shows the device of Figure 5 in its
fully expanded position; and

95 Figures 14 and 15 show two methods of
towing the hydrodynamic device illustrated in
Figure 5.

Referring to Figures 1 to 4, there is shown a
hydrodynamic device 2 comprising a first part 4
in the form of a flexible aerial, and a second part 6.

100 The first and second parts 4, 6 are connected
together by a hinge arrangement located at
position 8, the hinge arrangement being such that
the first part 4 is movable from a storage position
in which it lies adjacent to the second part 6 to an
105 operable position in which it upstands from and
extends from an end portion 6A of the second
part 6.

The second part 6 comprises an elongate
member having a plurality of transversely
110 extending hydrofoil elements 10 positioned on a
shaped elongate fairing member 12 which reacts
with the water flow in a manner which gives the
device vertical stability. The second part 6 further
comprises towing means in the form of a tow bar
115 14 for enabling a connection to be made between
the hydrodynamic device 2 and a towing vessel
(not shown) whereby the hydrodynamic device
can be towed in water with the first part visible
above the water and the second part submerged.
120 The tow bar 14 is provided at one end with a
towing eye 16 for receiving a tow line 18 and at
the other end a pivot 17 allowing freedom of
rotation of the tow bar 14 about a shaft 26 in the
elongate member.

125 Positioned beneath the tow bar 14 are a
plurality of weights 20, 22, 24 which are attached
to the shaft 26 and which are effective to balance
the hydrodynamic device 2. Positioned aft of the

weight 24 and on a shaft 28 is a rectangular damper plate 30.

As shown most clearly in Figure 2, three drag vanes 32 are provided between the two uppermost hydrofoil elements 10. These drag vanes 32 are effective to control the depth at which the second part 6 is submerged. The drag vanes 32 make the hydrodynamic device 2 very sensitive to small depth variations, such that it can follow water surface wave profiles.

Referring now to Figures 5 to 8, similar parts as in Figures 1 to 4 have been given the same reference numeral and their construction and operation will not again be given in order to avoid undue repetition of description.

It will be noted that the hydrodynamic device 2 illustrated in Figures 5 to 8 has a smaller tow bar 14 than in the hydrodynamic device 2 illustrated in Figures 1 to 4 and that the tow bar pivot 17 is no longer required. Also, in the hydrodynamic device 2 illustrated in Figures 5 to 8, only a single weight 34 is employed and there are no drag vanes 32 or damper plate 30.

In Figure 9, there are shown a plurality of the hydrodynamic devices 2 illustrated in Figures 5 to 8, these devices 2 being illustrated as they follow the wave profile of the sea 36.

In Figure 10, the hydrodynamic device 2 is shown attached to a 50 foot tow line 18 and the depth of tow can vary from 0 to 20 feet. The speed of tow can vary, depending upon the structural strength of the device 2, from 3 to 20 knots for example.

In Figure 11, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown in its stored position in which the first part 4 is lying adjacent the second part 6. The second part 6 is in fact stored on a platform 38 and the tow line 18 is wound around a winch drum 40. As the cable 18 is unwound from the drum 40, then the hydrodynamic device 2 unfolds as illustrated in Figures 12 and 13, Figure 12 illustrating an intermediate unfolded position and Figure 13 illustrating the fully unfolded position. The platform 38 can be submerged so that the hydrodynamic device 2 can be launched substantially automatically from a submerged condition.

Referring now to Figures 14 and 15, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown being towed by a vessel 38. In Figure 14, a sinker or depressor device 40 is attached to the tow line 18 so that the device is much closer to the vessel in Figure 14 than in Figure 15 where the sinker or depressor device 41 is not employed.

It is to be appreciated that the embodiments of the invention described above have been given by way of example only and that modifications may be effected. Thus, for example, the weighting arrangements 20, 22, 24 or 34 can be built into the second part 6 to form a part of the second part 6. Also, the first part 4 of the hydrodynamic

device 2 has been illustrated as a flexible aerial but this first part 4 of the hydrodynamic device 2 could also be a marker device, a target or a radar reflector. Also, different types of hinge 8 can be employed. If the first part 4 is small than a rigid attachment to part 6 such that it becomes merely an extension to the top of the main part 6 could be envisaged.

Claims

1. A hydrodynamic device comprising first and second parts which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements, and (b) towing means for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

2. A hydrodynamic device according to claim 1 in which the first and second parts are connected together by a sprung hinge arrangement.

3. A hydrodynamic device according to claim 1 or claim 2 in which the first and second parts are so connected together that the first part lies substantially exactly flat.

4. A hydrodynamic device according to any one of the preceding claims in which the hydrofoil elements are spaced apart by spacer elements.

5. A hydrodynamic device according to any one of the preceding claims in which the pair of hydrofoil elements that are uppermost when the device is being towed through the water are provided with drag vanes for controlling the depth at which the second part is submerged.

6. A hydrodynamic device according to any one of the preceding claims in which the towing means is a towing eye.

7. A hydrodynamic device according to any one of the preceding claims including weighting means for stabilizing the hydrodynamic device and for causing it to tow in a vertical or an inclined position.

8. A hydrodynamic device according to claim 7 in which the weighting means is positioned on the end portion of the second part that is remote from the first part.

9. A hydrodynamic device substantially as herein described with reference to the accompanying drawings.

New claims or amendments to claims filed on 28/8/79.

Superseded claims 1.

New or Amended Claims:—1

"hydrofoil" on line 9 of claim 1 should read "hydrofoil"

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